Using Computer Aided Image Generation to Enhance the Realism of Animated Characters

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Abstract. CAD software can be used to design and create three-dimensional models of animated characters. These models can be designed to be extremely detailed and realistic, including facial features, body proportions, textures, and lighting. CAD software can also allow animators to accurately control and adjust the posture, movements, and expressions of characters to present more realistic character dynamics. In this article, the method of VR animation image generation based on GAN model is studied, aiming at improving the efficiency and diversity of VR animation generation. Firstly, the basic principle of GAN model and its application in VR animation are described in detail. Then, the basic principles of CAD and VR and their applications in animation design are introduced, and the optimization method of VR animation CAD design based on GAN model is studied. The results show that the GAN model efficiency and diversity of VR animation images, and at the same time ensure the generated images have high fidelity and quality. Compared with traditional image generation methods, GAN model has stronger generalization ability and better generation effect. The research results of this article provide an effective auxiliary tool for VR animation CAD design, which can help designers to generate high-quality VR animation images quickly, and also provide a useful reference for the application of GAN model in other fields.

Keywords: Computer Aided Design; Virtual Reality; Animated Characters; Realism; 3D Modeling
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1 INTRODUCTION

Due to the continuous growth of computer graphics and visual effects, computer animation has become an indispensable part of modern film and television, games and other entertainment industries. Among them, the realism of animation characters is very important for the quality of the whole animation work and the audience's perception experience. 3D graphics engine animation design has become an important component of today's digital entertainment industry. With the rapid development of intelligent algorithms such as artificial intelligence and machine learning, their application in 3D graphics engine animation design is also becoming increasingly widespread. Bao [1] explored the principles, application scenarios, and specific case studies of intelligent algorithms in 3D graphics engine animation design. In terms of animation generation, intelligent algorithms can be used to automatically generate complex character animations and object motion trajectories. Through neural networks and deep learning techniques, realistic character animations can be automatically generated based on given character models and motion states. In addition, intelligent algorithms can also be used to achieve physical simulations, providing a more realistic mechanical model for object motion, thereby improving the authenticity and credibility of animation. In order to improve the realism of animated characters, many researchers have adopted CAD and VR technology. CAD is widely used in industry, architecture, animation and other fields. In animation character making, 3D modeling technology can help designers create realistic character models. 3D modeling software, such as Blender, Maya, 3ds Max, etc., provide powerful modeling tools, which can accurately shape the shape, expression and other details of characters. Cao et al. [2] introduced a method for transferring facial expression animation in latent space through action units. This method can achieve flexible control of complex facial expressions and generate natural and vivid animation effects. By activating and combining action units, as well as adjusting them in potential space, we can achieve a smooth transition of facial expressions from the initial state to the target state. This method has broad application prospects in fields such as computer graphics, virtual reality, and game development. Real time 3D neural facial animation technology for binocular videos is an emerging facial animation technology that can generate highly realistic facial animations in real-time, enabling virtual characters to interact more vividly with users. This article will introduce the principle, implementation methods, and application prospects of this technology. The implementation of this technology requires a large amount of training data and strong computing power. During the training phase, a large number of binocular videos and corresponding facial expression images need to be collected for training neural network models. In the implementation phase, high-performance GPUs and deep learning frameworks are needed to achieve real-time feature extraction and 3D facial animation generation. In order to further enhance the realism of characters, texture mapping algorithm is widely used in 3D modeling. Texture mapping algorithm can map 2D image (texture) to the surface of 3D model, thus increasing the detail and realism of the model. In computer graphics and virtual reality, creating vivid and realistic facial expression animations is crucial. This type of animation can enhance the emotional expression and interactive experience of virtual characters, making users more immersed in the virtual environment. Fan et al. [3] introduced a method of transferring facial expression animation in latent space through action units to achieve more natural and vivid animation effects. Action units refer to the basic units that make up facial expressions, and each expression can be decomposed into a combination of action units. These action units can be independently activated and combined to achieve complex and varied facial expressions. Potential space refers to the possibility of association and arrangement between facial expression action units. By transferring action units in potential space, we can generate a series of continuous facial expression animations. In game development, by using 3D model and texture mapping algorithm, the appearance of characters can become very realistic. VR technology provides an immersive experience for animation character production. Traditional museum tourism methods are no longer able to meet people's needs for diversity, interactivity, realism, and other aspects. Therefore, the technology aims to improve the visiting experience of tourists, while also bringing more tourists and income to the museum. Hu et al. [4] introduced the technical characteristics, system architecture, module design, functional advantages, and application prospects of the system. 3D virtual simulation technology is a simulation technology based on computer technology that can create a highly realistic virtual environment. In the large-scale museum tourism demonstration system, this technology is widely used in scene construction, model production, animation design, and other aspects to provide a more realistic and vivid visiting experience. In the virtual environment, you can observe the character from any angle and adjust the details of the character's posture and expression to enhance its realism. At the same time, through the skeletal animation system, the real action can be captured on the virtual character, making it show realistic animation.

CAD in various fields is becoming increasingly widespread. The application of these two technologies in animation design is important for improving design efficiency and quality. Jing and Song [5] explored the combination of the two. 3D reality technology is a technology that generates three-dimensional images through computer technology. In animation design, 3D reality technology is mainly applied to model building, scene construction, and character design. By utilizing 3D reality technology, designers can create complex character and object models according to their needs. These models can have realistic texture, lighting, and shadow effects, making animated characters and objects more vivid and realistic. 3D reality technology can help designers construct various complex scenes, such as natural environments, buildings, indoor spaces, etc. Designers can meticulously depict the scene based on the story background and plot requirements, presenting a vivid and realistic animation world to the audience. Generally speaking, the combination of CAD and VR technology provides new possibilities for improving the realism of animated characters. They not only enable us to model the character more accurately, but also enhance the surface details and action capture of the character, thus providing more realistic character setting, visual effects and user experience. In order to discuss how these technologies are applied in practice, this article will explain them with a specific case. Suppose we are making an animated film called Magic Forest. In this film, we need to create some very realistic characters and scenes to create a magical forest world.

In computer-aided animation design, cubic B-spline curves are a very important mathematical tool that can be used to describe the motion trajectory and shape of objects. Cubic B-spline curves have many excellent properties, such as smoothness, flexibility, and strong adaptability, making them widely used in animation design. Li [6] will introduce the definition and properties of cubic B-spline curves, as well as their applications in computer-aided animation design. B-spline curve is a widely used parameter curve in computer graphics. The definition of a B-spline curve is based on a set of control points and a set of B-spline basis functions. B-spline curves have many important properties, including locality and non-convexity, which make them an important tool in the field of computer graphics, which makes them very suitable for describing complex geometric shapes and motion trajectories. By defining a series of keyframes and connecting them using a cubic B-spline curve, a smooth character animation can be created. Cubic B-spline curves can also describe the posture and expression changes of characters, thus achieving more realistic character animations. First of all, you need to use 3D modeling software to create a fine role model. In this process, we need to consider the facial expression, body posture, costume props and other aspects of the role. In order to make the character look more realistic, we can use texture mapping algorithm to apply exquisite texture map to the surface of the model. After the character model is created, the skeleton animation system can be used to realize the animation of the character. In this process, it is needed to capture the movements and expressions of real people and apply them to virtual characters. Through the skeletal animation system, the details of the character's posture, expression and action speed can be easily adjusted to enhance its realism. At the same time, you can also bind multiple character models to the same bone to realize the effect of simultaneous animation of multiple characters. This can greatly save production time and cost, and at the same time improve the authenticity and fluency of animation. Through head-mounted displays and handles, the audience can experience the role performance in the virtual environment. In the virtual environment, you can observe the character from any angle and adjust its details to enhance its realism. At the same time, you can also introduce the audience into the virtual environment and let them interact with the characters to increase the realism and immersion of the viewing experience. The research specifically includes the following innovations:

(1) This article discusses the application of 3D modeling, texture mapping algorithm, bone animation system and VR technology in animation character making, and shows how these technologies can be comprehensively used to improve the fidelity of characters.

(2) By analyzing the case of "Magic Forest", how to use CAD and VR technology to make realistic character models, how to use skeletal animation system to realize character animation, and how to combine VR technology to enhance the audience's viewing experience.

(3) By expounding the role of new technologies in improving the realism of animation characters, the importance of these new technologies in animation production is highlighted, which is helpful to promote more researchers to devote themselves to the research in this field.

The first section briefly introduces the development history and application fields of VR animation images, and expounds the main challenges currently faced. The second section summarizes the research work of scholars in this field and puts forward the improvement direction of this article. The third section expounds the basic principle of GAN model and its application in VR animation CAD design. In the fourth section, the method of VR animation image generation based on GAN is proposed. The fifth section will show the experimental results, including the quality, diversity and fidelity of the generated VR animation images. The sixth section will summarize the main work and achievements of this article, and discuss the direction and challenges of future work.

2 RELATED WORK

In the field of contemporary art is becoming increasingly widespread. Computer assisted design provides artists with more ways of expression and creative possibilities. Liu and Yang [7] provide a brand-new creative platform that allows us to explore various innovative design solutions. By using CAD software, students and artists can design and create innovative works that traditional art forms cannot achieve. The contemporary art computer-aided design teaching model with innovation as the core emphasizes student-centered, personalized education, students' innovation ability and practical operation ability have been improved. At the same time, this teaching model has also cultivated artistic talents with innovative spirit and practical ability for enterprises and society, promoting the development and progress of contemporary art. The generation model of the true scanning path for 360 images computer graphics, which is widely used and has significant implications for achieving realistic graphics rendering, virtual reality, augmented reality, and other aspects. In the field of IEEE visualization and computer graphics, the research and application of this model also play an indispensable role. Martin et al. [8] introduced a generation model for the true scanning path of 360 images and its application in IEEE visualization and computer graphics, and evaluated and optimized it through visual display. The generation model for the true scanning path of 360 images is a neural network-based model, the parameters of the model include convolutional kernel, pooling size, and the number of nodes in the fully connected layer. The training data of this model needs to include a large number of 360 images and their corresponding real scanning path data, which is used to train the neural network to learn the mapping relationship from images to scanning paths. Nagao et al. [9] explored the application of impact sound generation in building scale virtual reality and its audio-visual interaction effects with real-world movable objects. By combining acoustic principles with virtual reality technology, realistic sound effects can be achieved, thereby improving the realism and immersion of virtual reality. The application range of impact sound generation is wide, and it can be used to achieve audio-visual interaction with movable objects in the real world, improving user interaction experience.

The correct use of impact sound generation technology can enhance users' trust and participation in virtual environments, further promoting the development of building scale virtual reality technology. Although impact sound generation has been widely applied in building scale virtual reality, there are still many research directions worth further exploration. For example, how to generate more realistic sound effects based on the physical properties of objects, and how to achieve more natural sound interaction. Which needs to be continuously improved and perfected to meet new needs. With the continuous development of virtual reality (VR) technology, virtual avatar technology has become one of the keys to achieving immersive interactive experiences. Facial animation is an important component of virtual avatar technology, and its research can effectively enhance the vividness and realism of virtual characters. Autoregressive Neural Networks (ARNN) is a deep learning model that can automatically learn input sequence features and has broad application value. Paier et al. [10] explored how to use autoregressive neural networks and virtual reality avatar technology to achieve example based facial animation. To implement example based facial animation, it is first necessary to collect and organize a large amount of facial animation data. These data include facial expressions, muscle movements, speech, etc., used to train autoregressive neural networks. Through training, neural networks can learn the temporal relationships of various facial animation features and predict new facial animations based on these relationships. Through experimental verification, we found that this method has advantages such as high realism, vividness, frame rate, and real-time response ability. However, current methods still have some limitations, such as a high demand for training data and limited model inference time. Qiao et al. [11] introduced a framework for quickly generating realistic hair animations based on deep learning. This framework mainly includes four parts: data preparation, model training, real-time calculation, and result display. In the preparation stage, we need to collect high-quality hair animation data, including head position data, hair contour data, color data, etc. In order to obtain this data, we may need to use devices such as 3D scanners for data collection and organize the data into a format suitable for deep learning model training. The model, we also need to design data preprocessing and data augmentation algorithms to clean, normalize, and randomly perturb the data. In the model training stage, we need to establish deep learning models, including hair animation mechanism models, hair growth direction prediction models, color change prediction models, etc. These models require the use of a large amount of data for training and the application of optimization algorithms to improve model training speed and accuracy. We also need to design different model structures and adjust parameters for different types of hair animations to achieve the best training results.

In film and television animation design, it is crucial to ensure continuous changes in the scale factor. Therefore, Shan and Wang [12] constructed a scale factor field. The distribution of forces formed by this field on the surface of an object is similar to that under lighting conditions. At the same time, by constructing this scale factor field, we can form an implicit expression in the image, thereby effectively analyzing and processing the image. Deep learning-based feature extraction utilizes deep neural networks for self-learning and extraction of features, enabling more accurate description and representation of various features in images. We use deep convolutional neural networks (CNN) for feature extraction, using the 3D model obtained in the previous step as input, and automatically learn and extract various features from low to high levels, avoiding the tedious process of manually designing features and improving the efficiency and accuracy of feature extraction. 3D animation design has been widely applied in various fields. The integration of the two enables virtual reality technology to present 3D animation design works more vividly and vividly, bringing a brand-new visual experience to various industries. Shen and Bai [13] explored the integration of virtual reality technology and 3D animation design, from a technical perspective, involves multiple technical fields such as computer graphics, human-computer interaction, and sensors. From an artistic perspective, it emphasizes the innovation and personalization of design. In the market, the integration of virtual reality technology and 3D animation design has spawned a series of emerging industries, becoming new growth points in the market. Deep sketching, as an emerging computer graphics technology, can accurately depict objects through depth information, providing a new solution for 3D hair modeling. Shen et al. [14] introduced a 3D hair modeling method and implementation process based on deep sketching. Deep sketch technology is a method of using depth information to depict objects. It can generate high-definition and high-precision 3D models by capturing depth information on the surface of the object. In 3D hair modeling, deep sketching technology can be used to obtain depth information of hair and establish a 3D model of hair based on this information. Using computer vision technology, extract depth information from photos and generate a depth map of hair. This step requires the use of specialized algorithms and software for processing. Utilize deep sketching technology to convert depth maps into 3D models. This process requires the use of professional graphics processing software and technology to convert depth information into actual model data, ultimately establishing a three-dimensional hair model with high detail and realism. With the popularity of smartphones, the UI design of applications has become increasingly important. A good UI design can provide an intuitive, easy-to-use, and attractive interface, thereby improving the user experience. Srivastava et al. [15] focused on exploring the importance of operable UI design in smartphone applications. Designers need to understand the needs and habits of users from their perspective, in order to provide interface designs that align with their intuition and expectations. A clear information architecture helps users quickly understand and use applications. Designers need to organize information according to its importance and relevance, so that users can easily find the required content. Good visual design can intuitively express the operation process and information content, while also adding aesthetics to the application. Designers need to use elements such as color, font, layout, etc. to create attractive and easy to understand interfaces.

The core of this technology lies in the use of self-supervised learning algorithms, trained through large-scale image datasets with diverse poses, to learn image features and patterns under different poses and angles, and establish mapping relationships. When generating image animations, the algorithm can automatically predict the corresponding posture based on the input original image and generate animations of the corresponding posture. It allows for adaptive conversion between image animations in different fields. Mainly relies on advanced technologies such as deep learning and convolutional neural networks (CNN). By training deep learning models, Wang et al. [16] enabled the system to automatically learn pose features of image animations in different fields and achieve adaptive transformations. In addition, using convolutional neural networks, we can effectively extract and classify features of images, thereby achieving more accurate attitude adaptive transformation. We conducted a series of experiments. Firstly, we collected image animation data from different fields and performed preprocessing and feature extraction on them. Then, we use this data to train a deep learning model and test its performance. The experimental results show that through deep learning and convolutional neural network methods. In VR technology, the design of 3D animation scenes plays an important role. Zhao and Zhao [17] explored computer-aided graphic design and related issues for 3D animation scenes oriented towards virtual reality. In 3D animation scene design, computer-aided graphic design utilizes advanced software and technology to design and optimize elements such as scenes, characters, props, etc., in order to improve the overall quality of the animation. Computer assisted graphic design mainly includes two principles and methods: geometric based methods and image-based processing. The computer-aided graphic design of 3D animation scenes for virtual reality has a wide range of applications in various fields, which is of great significance for improving visual experience and viewing quality. The application range of self-supervised pose adaptation technology is very wide, including games, film and television, advertising, UI design, and other fields. For example, in the field of gaming, this technology can be used to achieve automatic rendering and animation of characters in different poses and angles; In the field of film and television, this technology can be used to create realistic virtual scenes and special effects; In advertising and UI design, this technology can be applied to create dynamic graphics and icons. We are increasingly using computer-generated virtual humans for various interactions and entertainment. Virtual humans have become an important element in fields such as games, movies, and advertising. However, there is still controversy over the importance of realism in the perception and expressive power of virtual humans. Zibrek et al. [18] explored the importance of realism in perceiving expressive virtual humans in virtual reality. Virtual humans refer to digital character images created through computer technology. These characters can interact and perform in a three-dimensional environment, and can possess various attributes and skills. Virtual reality technology provides us with a virtual environment that can immerse and interact with each other. In the past few decades, research on the perception and expressiveness of virtual humans has become a hot topic in fields such as computer graphics, human-computer interaction, and the entertainment industry. Some scholars believe that realism is an important factor in perceiving expressive virtual humans. They believe that if virtual humans lack realism, it will be difficult for users to establish emotional connections and trust with them. Other scholars hold different views, believing that perceiving the expressive power of virtual humans does not necessarily require a sense of reality. They believe that creative and imaginative virtual humans can also be attractive.

Although a lot of progress has been made in this field, there are still some shortcomings, and more research is needed to explore how to combine CAD and VR technology with other advanced technologies to further enhance the realism and expressiveness of animated characters. In this article, a conditional GAN model based on multi-scale feature fusion is proposed.

3 OPTIMIZATION OF VR ANIMATION CAD DESIGN BASED ON GAN

For any machine learning task, the quality and relevance of data are crucial. This step will involve extracting useful information from the existing CAD design database, such as the sketch of the design, structural parameters of the model, texture and color information, etc., and transforming it into a format that GAN model can handle. In order to increase the realism of animated characters, complex lighting and rendering algorithms are needed. These algorithms can simulate the light behavior in the real world and add shadows, reflections and highlights to the characters. Common lighting and rendering algorithms include ray tracing, shadow mapping and environment mapping. Figure 1 is 9 frame of original animation for feature extraction of animated character images.

Figure 1: Nine frames of original animation for feature extraction of animated character images.

In the feature extraction and learning stage, GAN model will learn the key features and rules of CAD design through a large number of training data. These features and rules will be the basis for generating high-quality VR animation images. GAN model includes generator and discriminator. The generator will try to generate images that look like real CAD designs, and the discriminator needs to judge whether these images are real or not. This process will be repeated until both the generator and the discriminator achieve satisfactory performance. Once the training is completed, the GAN model can generate a new VR animation design. Users can provide some additional design requirements and constraints (such as specific shapes, colors, textures, etc.), and the GAN model will generate new designs that meet the requirements according to these requirements and constraints. Finally, the newly generated VR animation design needs to be assessed and optimized. The evaluation process can be completed by manual evaluation or evaluation algorithm based on artificial intelligence, and optimization may involve some adjustments and improvements to the design.

In order to make the animated characters perform realistic actions, the skeletal animation system can be used. This system allows animators to bind animations to the bones of characters and use keyframes or physical simulations to define motion. The skeletal animation system can be integrated with 3D modeling software to achieve more efficient character animation. Figure 2 is a skeleton animation effect diagram of a character model driven by a motion data file.

Figure 2: Skeleton animation generation.

Extend the contour boundary counterclockwise:

$$d_i = \sqrt{(x_i - x_c)^2 + (y_i - y_c)^2} \tag{1}$$

$$L_D^R(I) = -t \cdot \log\left[D_R(I)\right] + (t-1) \cdot \log\left[1 - D_R(I)\right] \tag{2}$$

The loss function is represented in the form of cross entropy, and we can define it as: Cross entropy Next, we need to convert any two gait sequences into distance signal sequences. Convert sequence1 into a distance signal sequence and sequence2 into a distance signal sequence. Finally, when constructing a feature space, analyze the projection trajectories in the feature space:

$$P_1(t) = \left[\ell_1, \cdots, \ell_k\right]^T I_1(t) \tag{3}$$

$$P_2(t)=[\ell_1,\cdots,\ell_k]^T I_2(t) \quad (4)$$

$$d^2 - \min_{ab} \sum_{i=1}^{T} \left\| P_1(t) - P_2^{'}(at+b) \right\|^2 \quad (5)$$

The collected VR animation images are preprocessed to prepare for training GAN model. Pre-processing may include image resizing, pixel value normalization and other steps, so that these images can be accepted by the GAN model. In addition, we need to know various attributes of these images, such as color, texture and shape, so that we can extract information from the images later. The generator in the GAN model will generate a new VR animation image according to the features extracted from the image. We will use a generator network similar to the coding-decoding structure to map the extracted features to the new image. This process may involve some complex deep learning techniques, such as condition generator and self-attention mechanism. The discriminator in the GAN model will be responsible for judging whether the image generated by the generator is true or not. We will design a convolutional neural network to realize this function. This network will accept the image generated by the generator and the corresponding real image, and then output a scalar value through a series of convolution layers, nonlinear activation functions and probability calculation, indicating whether the image is real or not. The animation information extraction framework is shown in Figure 3.

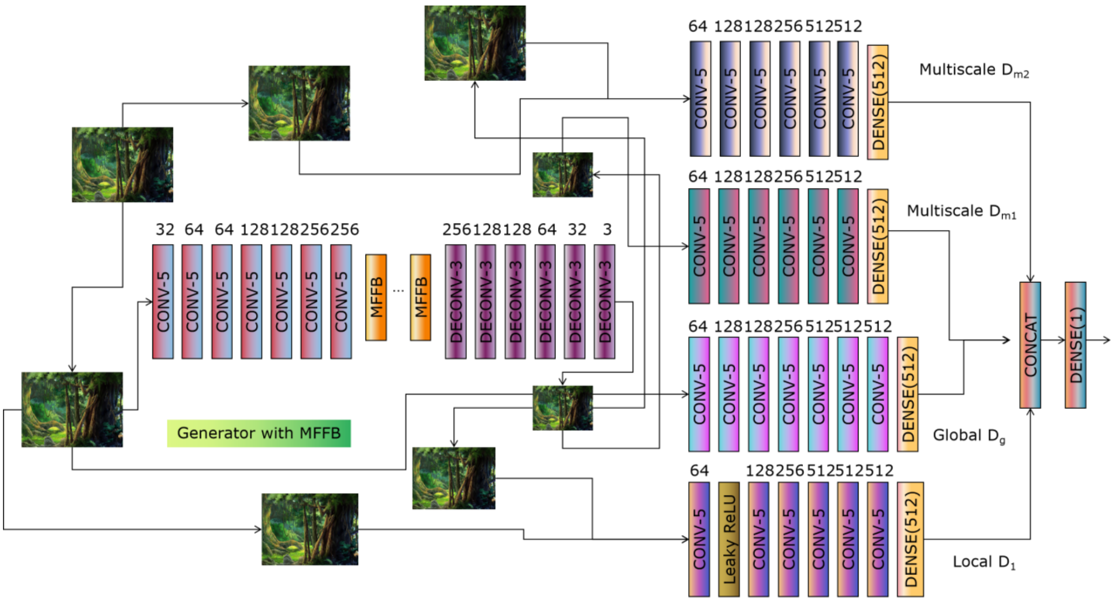

Figure 3: Model framework of VR animation image information extraction based on GAN.

For the training of generators and discriminators, common countermeasures are adopted:

$$\min{}_G \max{}_D L_{adv} = E\left[\log D\left(\hat{y}^b\right)\right] + E\left[\log\left(1 - D\left(G\left(V\left(E\left(p^a\right)a, b\right)c\right)\right)\right)\right] \quad (6)$$

$$h_p^{'}(x,y) = \begin{cases} 1 & if \ x_p \in y_p \\ 0 & otherwise \end{cases} \quad (7)$$

According to the problem description, the difference between the coordinate value of the image point and the coordinate value of the image center in the user area is the coordinate value of the image point in the image coordinate system.

Assuming the coordinates of the image center in the user area are (u0, v0), the coordinates of the image points are (u, v), and the coordinates in the image coordinate system are (x, y).

$$A = (x - lWidth/2, y - lHeight/2) \tag{8}$$

$$(x, y) = \left(\sum_{i=1,n} x_i / n, \sum_{i=1,n} y_i / n \right) \tag{9}$$

In each round of training, the generator will improve its generating ability according to the feedback obtained from the discriminator, and the discriminator will distinguish the real image from the generated image as much as possible. This process will continue until the GAN model can generate realistic and diverse VR animation images. Through this GAN-based VR animation image information extraction model, various useful information, such as shape, color and texture, can be extracted from a given VR animation image and used to generate a new VR animation image. This model can not only improve the efficiency and diversity of VR animation generation, but also help us to better understand and utilize various attributes of VR animation images.

4 RESULT ANALYSIS AND DISCUSSION

The subject of this article is to generate VR animation images by using GAN. Collect and sort out the VR animation image data set suitable for experiments, including various types of image data, such as people, scenes, objects, etc. These data should include a variety of styles, colors and details for model training and testing. GAN model is trained by using the prepared data set. In the process of training, it is needed to set the learning rate and batch size reasonably. In the process of testing, it is needed to objectively assess the output of the model to quantify the accuracy and stability of the model. Analyze the test results and compare the performance differences between GAN model and other classical models. By analyzing the experimental results, the superiority and potential of GAN model in VR animation image generation task are obtained. Figure 4 shows the root mean square error of training samples.

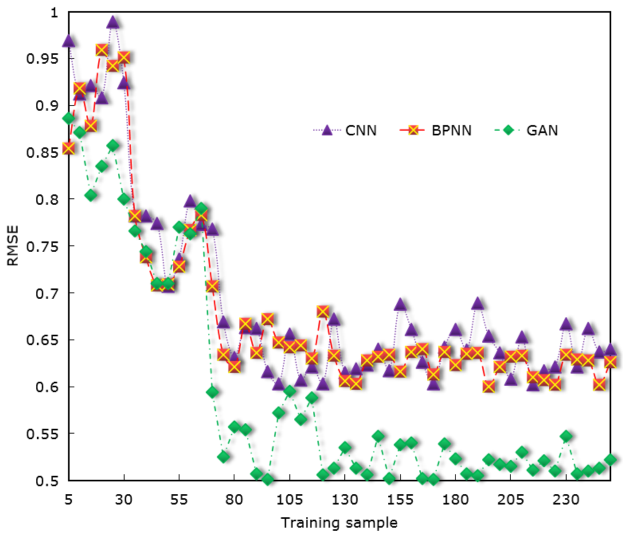

Figure 4: Root mean-square error of training samples.

As can be seen from Figure 4, this shows that in the initial stage of training, the generator and discriminator can learn and adjust quickly. At this stage, the ability and performance of the model

will be significantly improved, thus making the generated VR animation image more realistic. However, with the progress of training, the speed of root mean-square error decreases slowly.
This may be because the model is close to the optimal solution, or because the size and complexity of the data set limit the learning ability of the model. This result also verifies the effectiveness of the strategy of confrontation training. In confrontation training, the generator and discriminator will play a game, so that the generator can generate more realistic images. At the same time, the discriminator is constantly learning and improving its discriminating ability to distinguish the generated image from the real image. This game process can be regarded as an optimization process, which makes the generator and discriminator gradually approach the optimal solution. The training effects of different algorithms are shown in Figure 5.

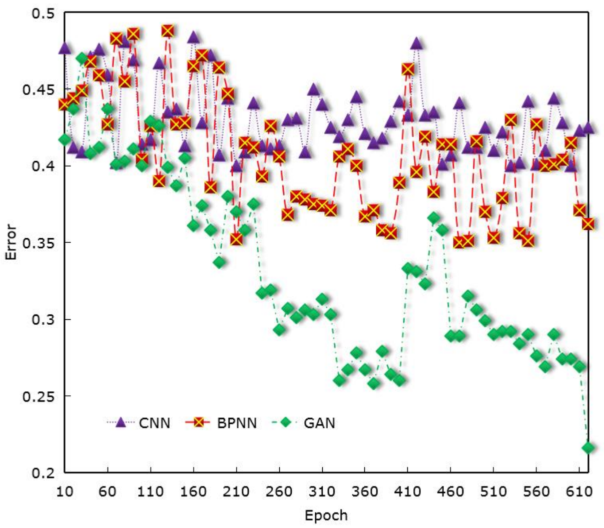

Figure 5: Training effect diagram of different models.

From the experimental results, the training effect of GAN model is obviously better than that of classic CNN model and classic BPNN model. This result may be because the GAN model has stronger expression ability and better optimization performance. GAN model is composed of two networks: generator and discriminator. This structure enables GAN model to learn the characteristics and distribution of data more comprehensively, thus obtaining more accurate prediction results. The game process between the discriminator and the generator can also help the GAN model to learn the data characteristics and distribution better. In the training process, the discriminator will constantly try to distinguish the generated image from the real image, while the generator will constantly improve the quality of the generated image in an attempt to deceive the discriminator. This game process can help the GAN model to learn the characteristics and distribution of data more deeply, so as to get more accurate prediction results. Figure 6 shows the model error and Figure 7 shows the model accuracy.

The error performance of the classic CNN model is poor, and it finally stabilizes at around 0.67. This may be because the CNN model has insufficient ability to extract and express features when dealing with this task, or the model over-fits the training data. Although the BPNN model performs well in many tasks, from the results, it may not be able to handle the VR animation image generation task well. This may be because the BPNN model lacks consideration of the spatial structure of the image, and can only be adjusted at the pixel level, resulting in the image produced by the BPNN model being inferior to the GAN model in fineness and fidelity. This shows that GAN model not only performs well in training samples, but also has good generalization ability in test samples. GAN model can better understand and use the distribution information of data through confrontation training between generator and discriminator, thus generating more realistic and accurate VR animation images.

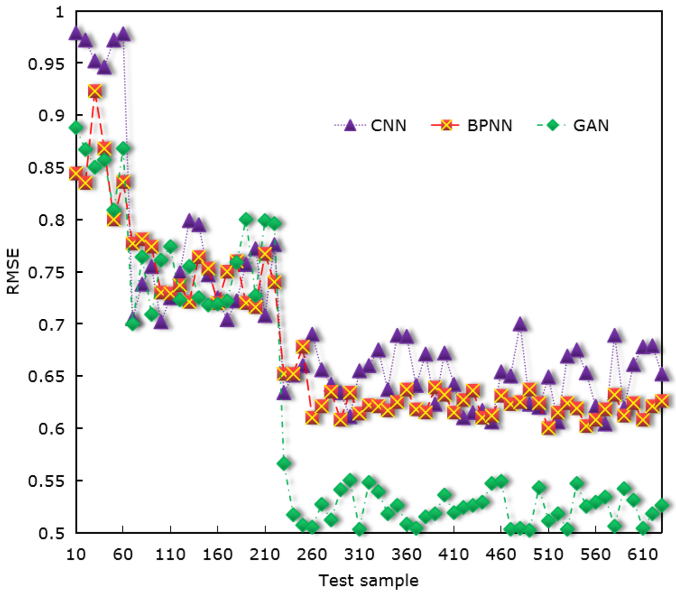

Figure 6: Error of the model in the test sample.

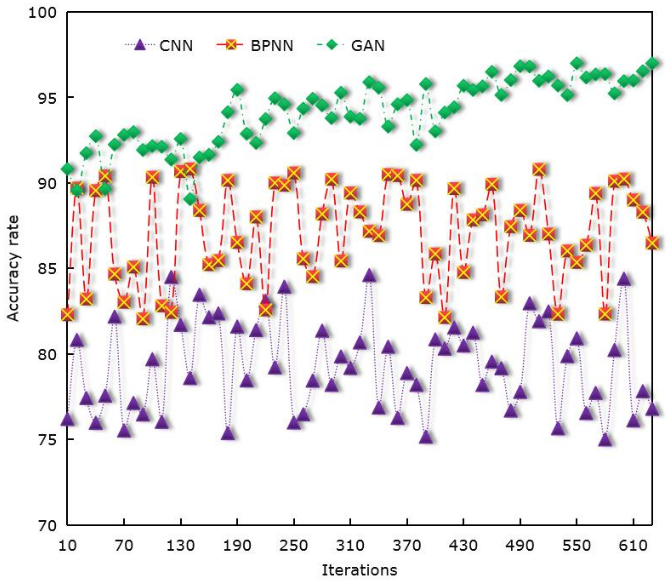

Figure 7: The accuracy of the model in the test sample.

The GAN model performs best in the test samples. In the testing process, the accuracy of the GAN model is finally stable above 90%, and the highest can reach 96.77%. This result shows the superiority and accuracy of GAN model in dealing with VR animation image generation tasks. This may be because the GAN model has stronger expressive ability and better optimization performance, and can better learn and use the characteristics and distribution information of data in the training process. Therefore, for the task of VR animation image generation, GAN model has better performance and application potential.

Through the above steps, the role model of "Magic Forest" will become more vivid, and the animation of the role will be smoother and more natural. At the same time, the combination of VR technology can make the audience feel the emotional atmosphere of role performance more deeply and get a richer viewing experience. The combination of these technologies will provide new possibilities and development directions for animation production, and will also bring more immersive viewing experience to the audience. With the continuous growth of technology, it is believed that the realism of animated characters will be further improved in the future, bringing more shocking visual feast to the audience.

5 CONCLUSION

The combination of CAD and VR technology provides a new possibility for improving the realism of animated characters. 3D modeling technology based on CAD can help designers to create realistic role models. VR technology provides an immersive experience for animation character production. In the virtual environment, you can observe the character from any angle and adjust the details of the character's posture and expression to enhance its realism. By analyzing the case of "Magic Forest", this article expounds how to use CAD and VR technology to make realistic character models, how to use skeletal animation system to realize character animation, and how to combine VR technology to enhance the audience's viewing experience. The research results provide an effective auxiliary tool for VR animation design, which can help designers to quickly generate high-quality VR animation images, and also provide a useful reference for the application of GAN model in other fields. In addition, it is also found that there are still some problems of patterning and stereotyping in generating VR animation images by GAN model, which will be a direction of future research. Future research can further improve the quality and diversity of VR animation images by improving the training method and structure of GAN model.

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